

## Hei Tautoko i te Marautanga Pāngarau

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# Te Ine





# Wāhanga 1

## Ngā Kōrero Whānui



### He Kupu Whakataki

Ko te kaupapa ia o tēnei pukapuka ko te āta whakaatu i ngā huatau matua o tēnei mea te ine me ngā whanaketanga ako, e eke ai ā tātou ākongā i ngā taumata o tēnei wāhanga o te pāngarau. Āpiti atu ki tēnā, ko te whakaatu i ētahi ngohe e hāngai ana ki tēnā taumata, ki tēnā taumata o te marautanga, me ngā hononga ki te Mahere Tau<sup>1</sup> me ngā Whanaketanga Pāngarau<sup>2</sup>.

main ideas

Number Framework

He mea nui tonu te ine i roto i ā tātou mahi o ia rā, i roto hoki i ngā tūranga mahi whānui, waihoki ka tino whakamahia te tau i roto i aua mahi ine. Nō reira he nui ngā hononga o te ine me te tau, ā, ki te kore e pakari te mātauranga me ngā rautaki tau o te ākongā, e kore hoki e pakari tana mahi ine.

I tua atu i tērā, ka tino whai wāhi atu te ine ki roto i ērā atu whenu o te pāngarau. E whai ake nei ētahi tauira.

<sup>1</sup> Tirohia: *Tē Poutama Tau, Pukapuka Tuatahi. Tē Mahere Tau*. Papaioea: He Kupenga Hao i te Reo (2011).

<sup>2</sup> Tirohia: *Whanaketanga Pāngarau: He aratohu mā te pouako*. Tē Whanganui-a-Tāra: Tē Tāhuhu o te Mātauranga. (2010).

## Te Tau

Ka tatauria ngā waeine hei whakatutuki inenga.

unit of measurement



E 3 rākau kōwhai te whānui o te pukapuka

Ka wāwāhia ngā waeine ki ōna hautanga.

break down/partition



13.7cm te roa o te pene

He mea matua te whakaaro pānga riterite e kitea ai ngā hononga o tētahi waeine ki tētahi.

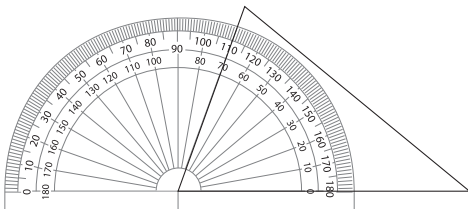
proportional thinking

karamu (g)	manokaramu (kg)	tana (t)
1000	1	0.001
6700	6.7	0.0067
	$\times 1000$	$\div 1000$
	$\times 1000$	$\div 1000$

## Te Hanga

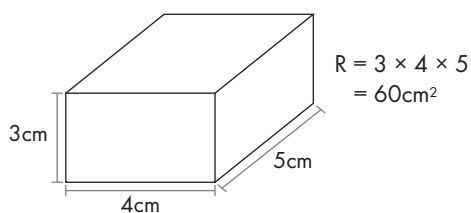
Ka inea ngā koki o tētahi āhua e kitea ai ngā pānga.

relation



Ka inea ngā tapa o tētahi āhua ahu-3 hei tātai i tōna rōrahi.

three-dimensional figure,  
volume

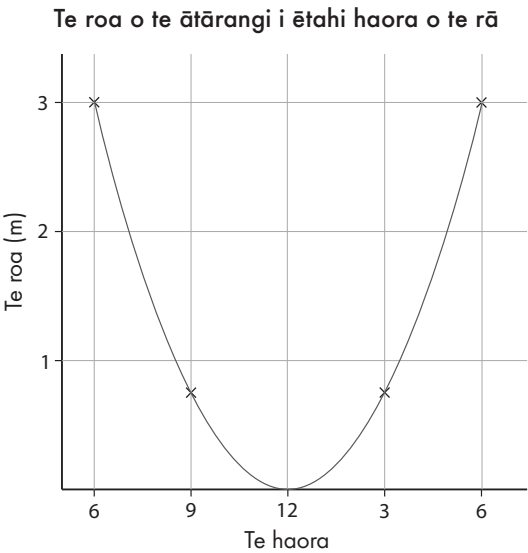


Te Taura me te Pānga

Ka inea te roa o te ātaarangi o tētahi pou i ngā haora o tētahi rā, e kitea ai te pānga o ngā taurangi e rua nei, te roa o te ātārangi me te haora o te rā:

relation  
variable

te tāima	6 ata	9 ata	12 rānui	3 ahiahi	6 ahiahi
te roa o te ātārangi (m)	3	0.75	0	0.75	3

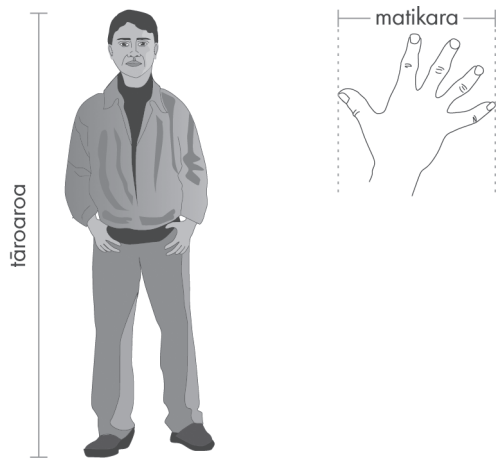


Te Tauanga

Ka inea te tāroaroa o tētahi huinga tamariki me ō rātou matikara hei tūhura i ngā tāpaetanga kōrero pēnei i ēnei:

hand span  
assertion

- He tāroaroa ake te hunga kōtiro i te hunga tamatāne, ina kei raro i te 12 tau te pakeke.
- He roa ake te matikara o te tangata tāroaroa i te tangata poto.



## Ngā Huatau Matua o te Ine

E ai ki ngā tohunga whakaako pāngarau, tekau ngā huatau matua o te ine (hei tauira, tirohia tā Lehrer 2003<sup>3</sup>). E whai ake nei he kōrero whakarāpopoto, he whakatauirā i aua huatau matua:

main ideas

1. Ko te whakatairite te pūtake o te mahi ine. E toru ngā momo whakatairite hei ine i tētahi mea:

compare

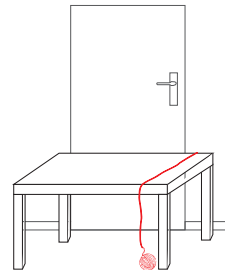
- Ko te whakatairite mata ki mata. Arā, ka whakanōhia ētahi mea e rua taha ki te taha kia kitea ai ko tēhea te mea nui, ko tēhea te mea iti, mēnā rānei he ōrite te rahi.

direct comparison



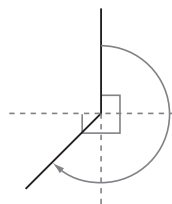
- Ko te whakatairite tipa. I konei, ka whakamahia tētahi mea kē atu hei whakatairite i te rahi o ētahi mea e rua. Hei tauira, ka whakamahia he aho e kitea ai mēnā he iti ake te whānui o te tēpu i te whānui o te kūaha.

indirect comparison



- Ko te whakatairite i tētahi mea ki tētahi waeine. Hei tauira, ko te koki hāngai hei ine i te rahi o tētahi koki.

right-angle



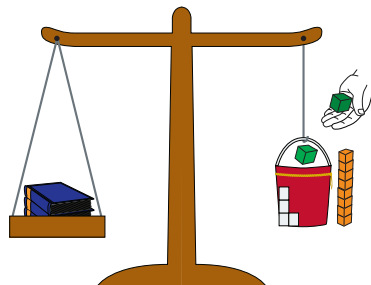
e  $2\frac{1}{2}$  koki hāngai te rahi o tēnei koki

2. He maha ngā āhuatanga o tētahi mea e taea ana te ine. Hei tauira, ko te pākete i te pikitia nei: ko tōna roa, tona paenga, tōna rōrahi, tōna taumaha, me tōna horahanga mata. E tika ana kia hāngai te waeine ki te āhuatanga e inea ana. Hei tauira:

bucket  
circumference

- Ko te pukapuka tētahi waeine aro kē hei ine i te taumaha o te pākete. Ko te karamu te waeine ngahuru.

- Ko te poro kākārīki tētahi waeine aro kē hei ine i te rōrahi (kītanga) o te pākete. Ko te rita (l) me te mitarau pūtoru (cm<sup>3</sup>) ētahi waeine ngahuru.



non-standard unit of  
measurement

metric unit

block

- Ko te poro karaka tētahi waeine aro kē hei ine i te roa o te pākete. Ko te mita (m) me te mitarau (cm) ētahi waeine ngahuru.

- Ko te papariki tētahi waeine aro kē hei ine i te horahanga mata o te pākete. Ko te mitarau pūrua (cm<sup>2</sup>) tētahi waeine ngahuru.

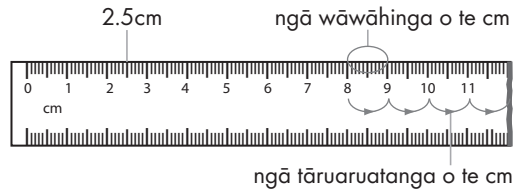
tile

3. Mā te wāwāhi me te tāruarua waeine e puta ai he āwhata. Hei tauira:

<sup>3</sup> Lehrer, R. (2003). Developing Understanding of Measurement. Kei roto i tā J. Kilpatrick, W.G. Martin, me D.E. Schifter (Etitā.). *A research companion to principles and standards for school mathematics*. (wh.179-192). Reston, VA: National Council of Teachers of Mathematics.

- Mā te tāruarua i te mitarau (cm), e puta ai te āwhata nei hei ine i te roa.
- Mā te wāwāhi i te mitarau (cm), e puta ai te āwhata mitamano (mm) hei ine i ngā mea iti.

partition, repeat, scale



4. Karekau he āputa ki waenganui i te tāruaruatanga o ngā waeine, kāore hoki e inaki.



E whakamahia ana te rākau karaka hei ine i te whānui o te tēpu, engari e hē ana, nā te mea he āputa kei waenganui i ngā rākau.

gap  
overlap



Kei te hē hoki tēnei, nā te mea e inaki ana ngā rākau karaka. E tika ana kia tāruaruatia ngā waeine, pito ki te pito.

5. Mā te tataui i ngā waeine ōrite e tutuki ai te inenga.



Ka tatauria te maha o ngā rākau karaka e kapi ai te whānui o te tēpu.

6. Mā te whakamahi waeine aro whānui e mārama ai te katoa ki te rahi o te mea e inea ana. Ko ngā waeine ngahuru hei tauira o te waeine aro whānui e whakamahia ana e te nuinga, puta noa i te ao. Arā:

standard unit of  
measurement,  
metric unit

- Mō te roa:  
Ko te mita (m), te mitarau (cm), te mitamano (mm), me te manomita (km).
- Mō te taumaha:  
Ko te karamu (g), te karamumano (mg) me te manokaramu (kg).
- Mō te rōrahi, te kitanga rānei:  
Ko te rita (l) me te ritamano (ml), ko te mita pūtoru ( $m^3$ ) me te mitarau pūtoru ( $cm^3$ ).
- Mō te koki:  
Ko te putu ( $^\circ$ ). E  $360^\circ$  i te huringa kotahi.



7. Ka taea te whakamahi waeine rerekē, me te whakatairite anō i aua waeine.

Ka tino puta te whakaaro pānga riterite i tēnei āhuatanga. Hei tauira:

proportional reasoning

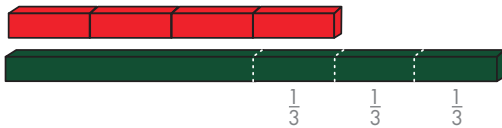
- E toru ngā rākau whero, ka rite ki te rākau kākāriki kotahi ( $kā = 3wh$ ):



- Nō reira, mēnā e 4 rākau kākāriki te roa o tētahi mea, ko te 12 rākau whero hoki te roa ( $4kā = 12wh$ ):



- Mēnā e 4 rākau whero te roa o tētahi mea, ko te  $1\frac{1}{3}$  rākau kākāriki tērā ( $4wh = 1\frac{1}{3}kā$ ):



- E ōrite ana te kotahi rau mitarau ki te kotahi mita ( $100\text{cm} = 1\text{m}$ ). Nō reira mēnā e 4 mita (m) te roa o tētahi mea, ko te 400 mitarau (cm) hoki te roa ( $4\text{m} = 400\text{cm}$ ). Mēnā e 4 mitarau (cm) te roa o tētahi mea, ko te 0.04 mita (m) tērā ( $4\text{cm} = 0.04\text{m}$ ).

8. Ka taea tētahi inenga te wāwāhi. Ka rite te tapeke o ngā wehenga ki te katoa o te inenga. Hei tauira:

- Ka kania he papa rākau ki ētahi wehenga e toru, e 45cm, e 60cm, e 35cm te roa. Hui katoa ēnei wehenga ( $45 + 60 + 35$ ), ko te 140cm ( $1.4\text{m}$ ) te roa o te papa rākau i mua i te kaninga.

- He mīti kurī tēnei, e 2.1kg te taumaha. Ina tapahia kia 7 ngā wehenga ōrite (tētahi mō ia rā o te wiki), ko te 300g te taumaha o ia wehenga ( $2.1\text{kg} \div 7 = 300\text{g}$ ).



9. Me āta tautohu te tīmatanga o te āwhata ine, waihoki kia hāngai tonu te tīmatanga o te āwhata ki te tīmatanga o te mea e inea ana.

indicate



I konei e inea ana te whānui o te pukapuka. Kua whakatakotoria te āwhata ki runga i te pukapuka kia noho pū te tohu '0' ki tētahi taha o te pukapuka.

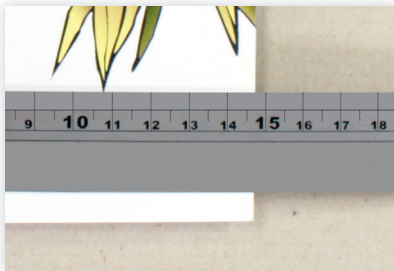


E taea ana ngā wāhi katoa o te āwhata hei wāhi tīmatanga, engari kia parematatia. I konei, ko te 3 te tīmatanga o te āwhata, nō reira hei whiriwhiri i te whānui o te pukapuka:  $18 - 3 = 15\text{cm}$

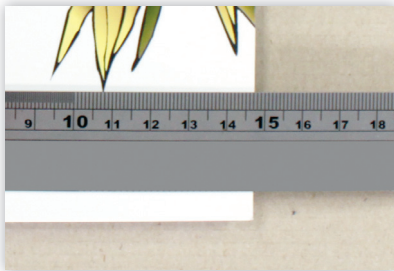
compensate

10. He whakaawhiwhinga ngā inenga katoa. Kei te rahi o te waeine te tōtika o te inenga.

round (a number),  
accuracy



15cm te whānui o te pukapuka (he paku iti iho i te 15cm).



14.8cm (148mm) te whānui o te pukapuka (he paku nui ake i te 14.8).



## He Tauira Mahere mō te Ine

Taumata 1	Te Mātauranga Ine	Te Whakaoti Rapanga Ine	Te Reo Matatini o te Ine
Whanaketanga 1a	<p>E mōhio ana ki ēnei āhuatanga o tētahi mea e taea ana te ine:</p> <ul style="list-style-type: none"> <li>• te roa;</li> <li>• te taumaha;</li> <li>• te wā;</li> <li>• te paemahana;</li> <li>• te utu.</li> </ul> <p>E mōhio ana ki te pūmautanga o tētahi inenga.</p>	<p>Ka whakatairite i te rahi o ētahi mea e rua, mata ki te mata.</p> <p>Ka raupapa i ētahi mea e rua i runga i te rahi o tētahi āhuatanga ine o aua mea (pērā i te roa, i te taumaha rānei).</p>	<p>E mōhio ana ki ngā kupu whakatairite (pēnei i te roa <i>ake</i>, taumaha <i>rawa</i> ...).</p> <p>E mōhio ana ki ngā kupu e hāngai ana ki te roa (pēnei i te whānui, te tāroaroa, te teitei, te hahaka, te hōhonu, te pāpaku, te tawhiti ...).</p>
Whanaketanga 1e	<p>E mōhio ana ki ēnei āhuatanga o tētahi mea e taea ana te ine:</p> <ul style="list-style-type: none"> <li>• te kītanga (rōrahi);</li> <li>• te horahanga;</li> <li>• te hurihanga.</li> </ul> <p>E mōhio ana ki ngā momo waeine aro kē e hāngai ana ki ngā āhuatanga e inea ana (pērā i te papanui me te pukapuka mō te horahanga; te matikara mō te roa; te kapu mō te kītanga).</p> <p>E mōhio ana ki te mita (m) me te mitarau (cm) hei waeine aro whānui mō te roa.</p> <p>E mōhio ana ki te pūmautanga o tētahi waeine.</p> <p>E mōhio ana ki te pūtakenga o tēnei mea te ine, arā, he whakatairite i te āhuatanga e inea ana ki tētahi waeine e hāngai ana.</p>	<p>Ka whakamahi i tētahi mea kē atu hei whakatairite i te rahi o ētahi mea e rua (pērā i te whakamahi i tētahi aho).</p> <p>Ka tika te whakamahi taputapu ine māmā me ngā waeine aro kē māmā (pērā i te whārite ine-taumaha, te aho, te mārō). Arā:</p> <ul style="list-style-type: none"> <li>• ka tīmata, ka mutu te ine i ngā wāhi e tika ana;</li> <li>• ka tāruaruatia te waeine, kāore he āputa, kāore hoki e inaki;</li> <li>• ka tataui i te maha o ngā waeine e hāngai ana ki te mea e inea ana (me te whai wāhi anō o ngā hautanga waeine māmā, pērā i te haurua).</li> </ul>	<p>E mōhio ana ki ngā kupu hei whakaahua i te rahi o te rerekē o ngā mea e rua e whakatairitea ana. Hei tauira:</p> <ul style="list-style-type: none"> <li>• He iti noa iho te taumaha ake ...</li> <li>• He tino rahi kē atu te roa o ...</li> <li>• Kāore i te tino rerekē te horahanga o ...</li> <li>• He paku te tāroaroa ake o ...</li> <li>• He haurua te rōrahi o ...</li> <li>• Kei te takiwā o te rearua te tawhiti ake o ...</li> </ul>

Taumata 2	Te Mātauranga Ine	Te Whakaoti Rapanga Ine	Te Reo Matatini o te Ine
Whanaketanga 2a	<p>E mōhio ana ki te rahinga āwhiwhi o ngā waeine aro whānui nei:</p> <ul style="list-style-type: none"> <li>• te mita (m), te mitarau (cm), te mitamano (mm), me te manomita (km) mō te roa;</li> <li>• te rita (l) mō te kītanga;</li> <li>• te manokaramu (kg) mō te taumaha.</li> </ul> <p>E mōhio ana ki te wāwāhi i tētahi waeine ki ōna hautanga māmā.</p> <p>E mōhio ana ki te pānui i te wā (karaka mati, karaka ringa), me ngā waeine mō te wā (pēnei i te meneti, te haora, te rā, te wiki, te marama me te tau).</p>	<p>Ka whakatau tata i tētahi inenga i runga i te mōhio ki te rahinga āwhiwhi o ngā waeine aro whānui.</p> <p>Ka tika te whakamahi taputapu ine, pēnei i te rūri, te ine-taumaha me te ipu ine-kītanga.</p> <p>Ka hanga taputapu māmā hei whakatutuki inenga roa, inenga taumaha hoki.</p>	<p>E mōhio ana ki ngā kupu me ngā tohu mō ngā waeine aro whānui.</p> <p>Ka tuhi pikitia hei whakaatu i te whakatairitenga o ētahi rahinga e rua.</p> <p>Ka whakaatu inenga ki tētahi rārangi tau.</p>
Whanaketanga 2e	<p>Ka arotake i te whaitakenga o tētahi inenga, arā:</p> <ul style="list-style-type: none"> <li>• te tika o te waeine;</li> <li>• te tōtika e hāngai ana;</li> <li>• te pātata ki te whakataunga tata.</li> </ul> <p>E mōhio ana ki te tātai inenga, mā te tāpiri, mā te tango, mā te whakarea, mā te whakawehe rānei.</p>	<p>E mōhio ana ki te pānui āwhata māmā e whakaatu ana i ngā hautanga waeine (pēnei i te haurua, te hauwhā, me te hautekau).</p> <p>Ka whakamahi i te koki hāngai me ngā hautanga koki hāngai hei waeine mō te koki me te hurihanga.</p>	<p>Ka tuhi kauwhata pou hei whakatairite inenga.</p>

Taumata 3	Te Mātauranga Ine	Te Whakaoti Rapanga Ine	Te Reo Matatini o te Ine
Whanaketanga 3a	<p>E mōhio ana ki ngā hautanga ā-ira (hautekau) o tētahi waeine (pērā i te 1.3 mita me te 4.5kg).</p> <p>E mōhio ana ki te rahinga āwhiwhi o tētahi koki (pēnei i te 45°, te 22.5°, te 180° me ētahi atu).</p>	<p>Ka whakatau tata i ngā inenga koki i runga i te mōhio ki te rahi o ngā koki matua.</p> <p>Ka tika te whakamahi i ngā taputapu ine nei, te ine-koki me te wāti tū.</p>	<p>E mōhio ana ki te tuhi me te whakahua tika i ngā hautanga ā-ira o tētahi waeine (kia kotahi te mati ā-ira).</p> <p>E mōhio ana ki te tuhi me te whakahua tika i ngā inenga wā (pērā i te 1:42.7 – kotahi meneti whā tekau mā rua ira whitu hākona).</p>
Whanaketanga 3e	<p>E mōhio ana ki ngā hautanga ā-ira o tētahi waeine, tae atu kia toru ngā mati ā-ira.</p> <p>E mōhio ana ki te tuhi me te whakamāori wātaka māmā.</p>	<p>Ka whakamahi tukutuku hei whakatau tata i te horahanga o tētahi āhua hikuwaru me tētahi taparau.</p> <p>Ka whakamahi tukutuku hei whiriwhiri i te horahanga o tētahi tapawhā hāngai.</p> <p>Ka whakamahi mataono rite hei whiriwhiri i te rōrahi o tētahi poro tapawhā.</p>	<p>E mōhio ana ki ngā kupu me ngā tohu mō ngā waeine horahanga (m<sup>2</sup>, cm<sup>2</sup>, ha), me te waeine rōrahi nei, te cm<sup>3</sup>.</p>

Taumata 4	Te Mātauranga Ine	Te Whakaoti Rapanga Ine	Te Reo Matatini o te Ine
Whanaketanga 4a	<p>E mōhio ana ki te whakawhiti waeine ngahuru. Hei tauira:</p> <ul style="list-style-type: none"> <li>• <math>\text{mm} \leftrightarrow \text{cm} \leftrightarrow \text{m} \leftrightarrow \text{km}</math>;</li> <li>• <math>\text{g} \leftrightarrow \text{kg}</math>;</li> <li>• <math>\text{l} \leftrightarrow \text{ml}</math>.</li> </ul> <p>E mōhio ana ki te pāpātanga hei ine i ētahi āhuatanga (pērā i te tere me te utu).</p>	<p>Ka whakamahi i ngā inenga tapa me ngā ture e hāngai ana hei tātai i te paenga, te horahanga me te rōrahi o ngā āhua māmā (pērā i te tapatoru, te tapawhā hāngai, me te pouaka).</p> <p>Ka whakamahi rautaki whakarea hei tātai i ngā inenga tapa o ngā āhua whakarahi.</p>	<p>E mōhio ana ki te tuhi me te whakahua tika i ngā inenga pāpātanga (pēnei i te <math>\text{km/h}</math> me te <math>\text{utu/kg}</math>).</p> <p>E mōhio ana ki te tuhi, ki te whakahua hoki i ngā whārite hei tātai horahanga māmā, rōrahi māmā hoki (pēnei i te <math>H = r \times wh</math> mō te horahanga tapawhā hāngai).</p>
Whanaketanga 4e	<p>E mōhio ana ki ngā inenga tōraro mō te paemahana me ngā tātaitanga e hāngai ana.</p> <p>E mōhio ana ki te tuhi, ki te whakamāori wātaka e whakaatu ana i ngā āhuatanga matatini.</p> <p>E mōhio ana ki ngā tikanga o te wā-24.</p>	<p>Ka tātai takanga wā (pērā i te roa o tētahi haerenga mēnā e mōhio ana te wā tīmata me te wā mutu).</p> <p>Ka whakamahi i ngā inenga me ngā ture hei tātai i te paenga me te horahanga o ngā āhua ahu-2 (pērā i te porowhita me te tapaono rite).</p> <p>Ka whakamahi i ngā inenga me ngā ture hei tātai i te rōrahi o ngā āhua ahu-3 (pērā i te rango me te poro tapatoru).</p> <p>Ka waihanga rautaki hei tātai i te horahanga me te rōrahi o ngā āhua whīwhiwhi.</p>	<p>Ka whakaatu inenga pāpātanga ki te kauwhata rārangi, ki te rārangi tau matarua, ki te tūtohi hoki.</p> <p>E mōhio ana ki te tuhi me te whakahua wā-24.</p>

Taumata 5	Te Mātauranga Ine	Te Whakaoti Rapanga Ine	Te Reo Matatini o te Ine
Whanaketanga 5a	E mōhio ana ki ngā tepe tōtika o tētahi inenga.	<p>Ka whakamahi i te ture a Pythagoras hei tātai i te tapa o tētahi tapatoru hāngai.</p> <p>Ka waihanga rautaki whaihua, ka whakamahi ture hei tātai i ngā tapa, te horahanga, te rōrahi, ngā koki me te horahanga mata o ngā āhua whānui.</p> <p>Ka whakatutuki i ngā momo inenga whānui, me te whakaatu anō i ngā tepe o te tika.</p>	<p>E mōhio ana ki te tohu ± hei whakaatu i ngā tepe tōtika o tētahi inenga.</p> <p>Ka whakaatu inenga ki te rārangi tau me ōna tepe tōtika.</p>